Make your own Model Astrolabe

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An astrolabe is an elaborate instrument which combines a mechanical model of the sky's rotation through the night – similar to a modern planisphere – with an observing instrument which allows the altitudes of objects in the night sky to be measured. Put together, these two components can be used the time of day, by determining the altitude of a star, and also at what time of day the sky's rotation brings it to that height above the horizon.

Historically, the astrolabe was the most sophisticated astronomical instrument in widespread use in the Middle Ages. In fact, it held this position for nearly two thousand years, from the time of Hipparchus (c. 190–120 BCE) until the turn of the seventeenth century, around the time that the telescope was invented in 1609.

Yet today this complex instrument is rarely seen outside of glass cases in museums, and those interested in learning about it may have some difficulty finding a specimen to play with. Ornately carved brass reproductions are available from some telescope dealers, but with substantial price tags attached. These price tags are historically authentic: mediaeval astrolabes were often made from high-cost materials and intricately decorated, becoming expensive items of beauty as well as practical observing instruments. But for the amateur astronomer who is looking for a toy with which to muse over past observing practice, a simpler alternative may be preferable.

This document provides a cardboard cut-and-glue kit to make your own model astrolabe, so that you can rediscover medieval observing practice for yourself. The astrolabe presented here is design for use at a latitude of $25°$N . Alternative versions, prepared for other latitudes, are available from the author's website:

http://in-the-sky.org/astrolabe/

Assembly Instructions

To build a model astrolabe tailored for a latitude of $25°$N , Figures 1, 2 and 3 should be printed out onto paper, or more preferably onto thin card. Figure 4 should be printed onto a sheet of transparent acetate. The two sides of the *mother* (Figures 1 and 2) should be glued rigidly back-to-back, perhaps sandwiching a piece of rigid card. The *rete*, printed onto transparent acetate[2], should be placed over the *climate*, which for simplicity is incorporated into the front of the mother in this document.

The *rule* and the *alidade* should be placed on either side of the astrolabe: the rule, marked out with a declination scale, should rotate over the front of the mother;

[2]Historically, the rete would have been made of the same material as the rest of the astrolabe and marked with arrows showing the positions of prominent stars. As much of the material of the rete as possible would then have been cut away to allow the climate below to be seen. We use transparent plastic here because it is so much more practical than the traditional form of rete.

the alidade should rotate over the back of the mother. The two tabs on the side of the alidade should be folded out to form a sight used for measuring the altitudes of celestial and terrestrial objects. The whole construction may then finally be fastened together by placing a split-pin paper fastener through the centre.

How to use an astrolabe

For more information about how to use your astrolabe, see the author's website,
http://in-the-sky.org/astrolabe/

or download a copy of the author's paper about the astrolabe, which was published in the Journal of the British Astronomical Association, and can be downloaded here:
http://in-the-sky.org/astrolabe/astrolabe_jbaa.pdf

Customised Astrolabes

The astrolabe images presented here were produced using PyXPlot, an open-source vector graphics scripting language developed by the same author. PyXPlot has a website[3] with extensive documentation, and is available as a standard package in a number of Linux distributions including Ubuntu, Debian and Gentoo. Unfortunately, it is not available for Microsoft Windows at the present time.

The PyXPlot scripts used to generate the images in this document are included in the accompanying file archive and may be modified to generate customised astrolabes. For example, to produce an astrolabe with your own choice of saints' days or birthdays on the back of the mother, the file `RawData/SaintsDays.dat` should be modified. A `python` script, `main.py`, is included which rebuilds all of the image files shipped in the `astrolabe_parts` folder.

References

[1] Ford, D.C., *J. Brit. astr. Ass.*, 131(1), 33 (2012).

[2] Chaucer, G., *Treatise on the Astrolabe*, in *The Riverside Chaucer*, ed. L.D. Benson (Boston, 1987)

[3] Eisner, S., *J. Brit. astr. Ass.*, **86**(1), 18-29 (1975)

[4] Eisner, S., *J. Brit. astr. Ass.*, **86**(2), 125-132 (1976a)

[5] Eisner, S., *J. Brit. astr. Ass.*, **86**(3), 219-227 (1976b)

[3] http://www.pyxplot.org.uk
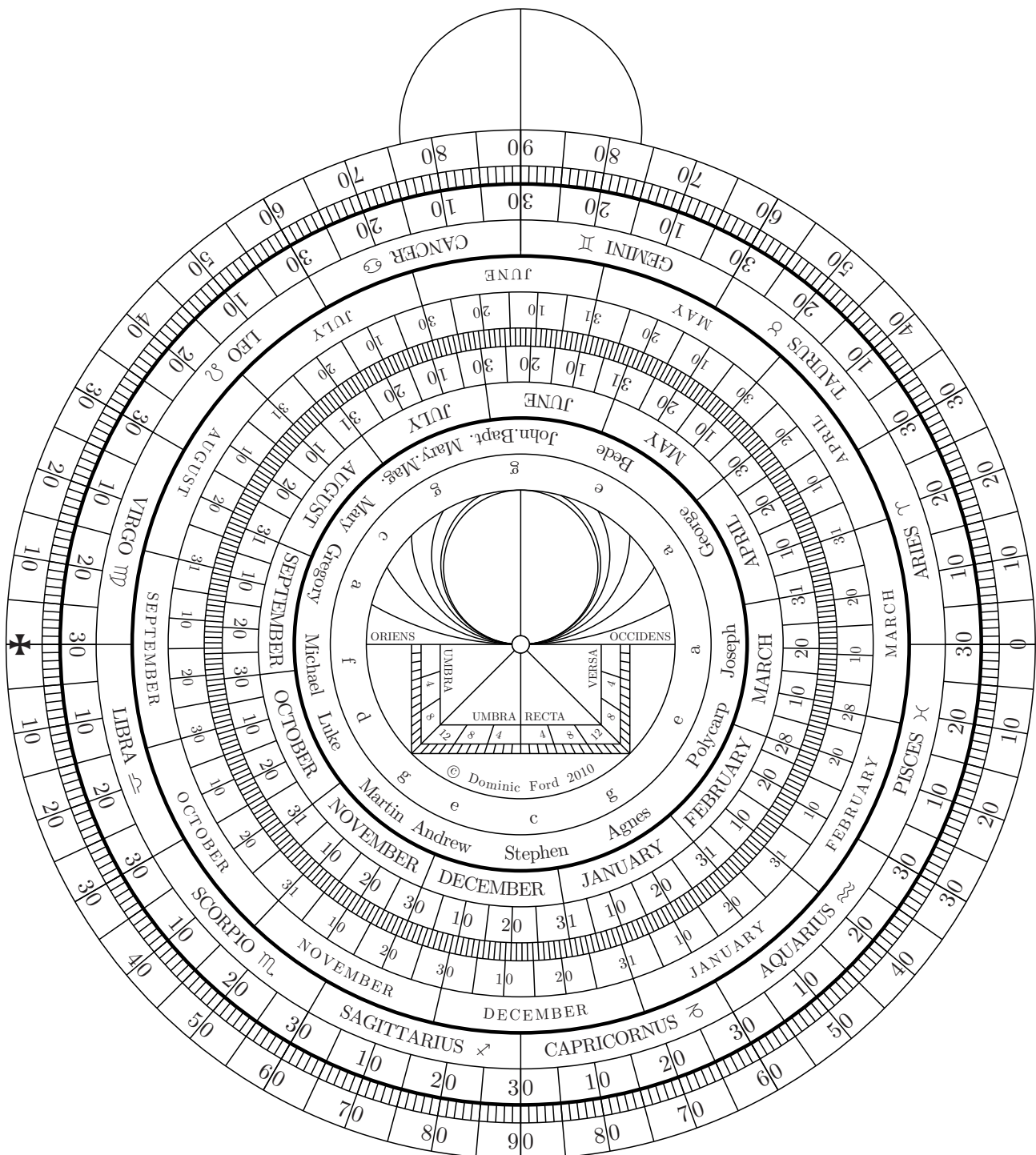
Figure 1: The back of the mother of the astrolabe.
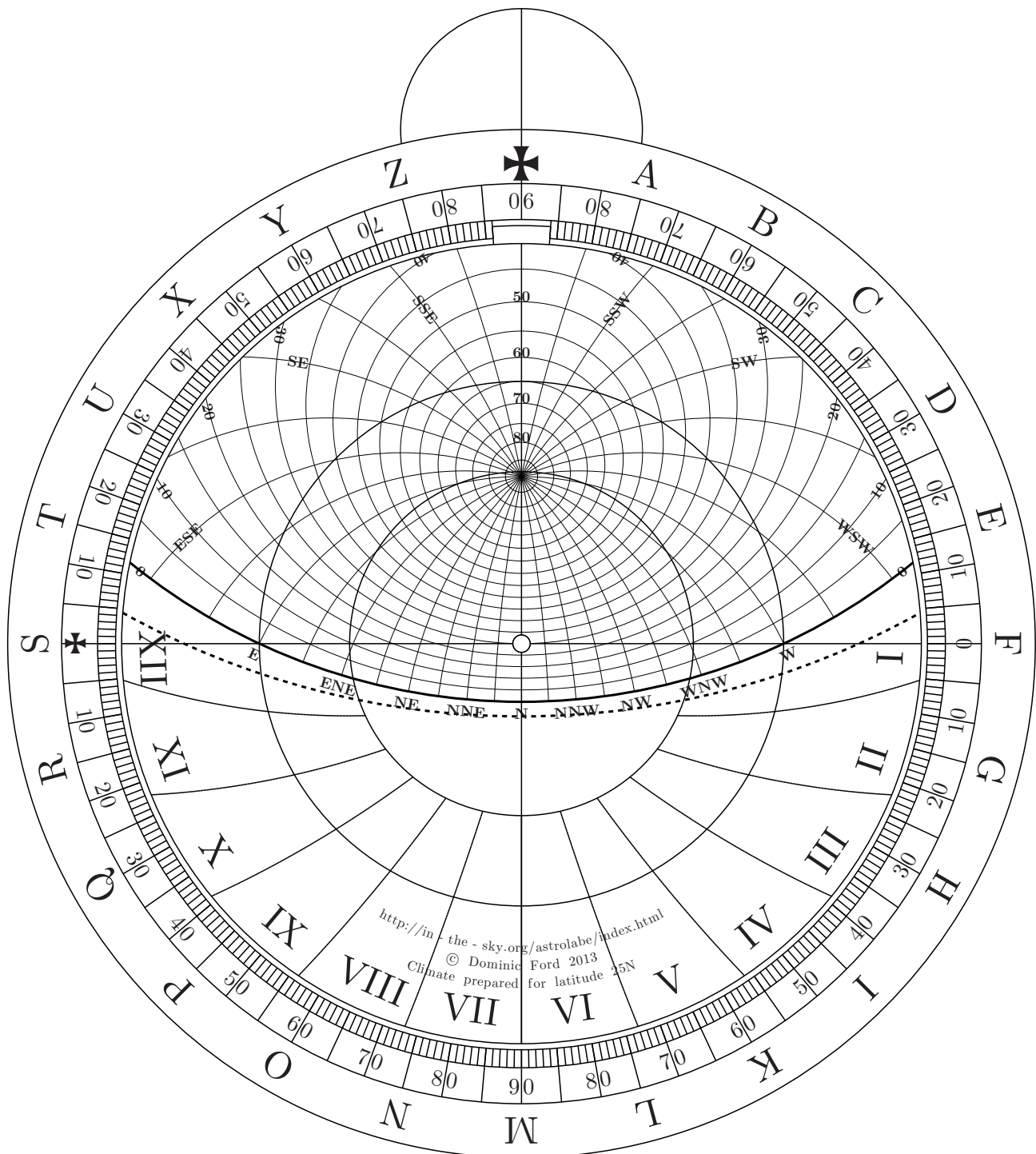
Figure 2: The front of the mother of the astrolabe, with combined climate. Should a climate for a different latitude be required, the accompanying file archive should be downloaded. This includes alternative versions of this document for any latitude on the Earth at 5° intervals.
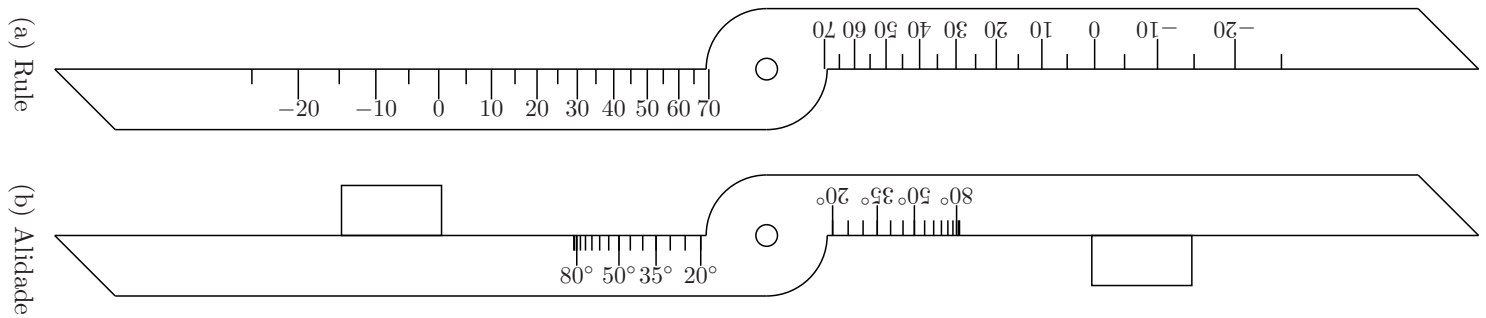
Figure 3: Left: The rule, which should be mounted on the front of the astrolabe. Right: The alidade, which should be mounted on the back of the astrolabe.
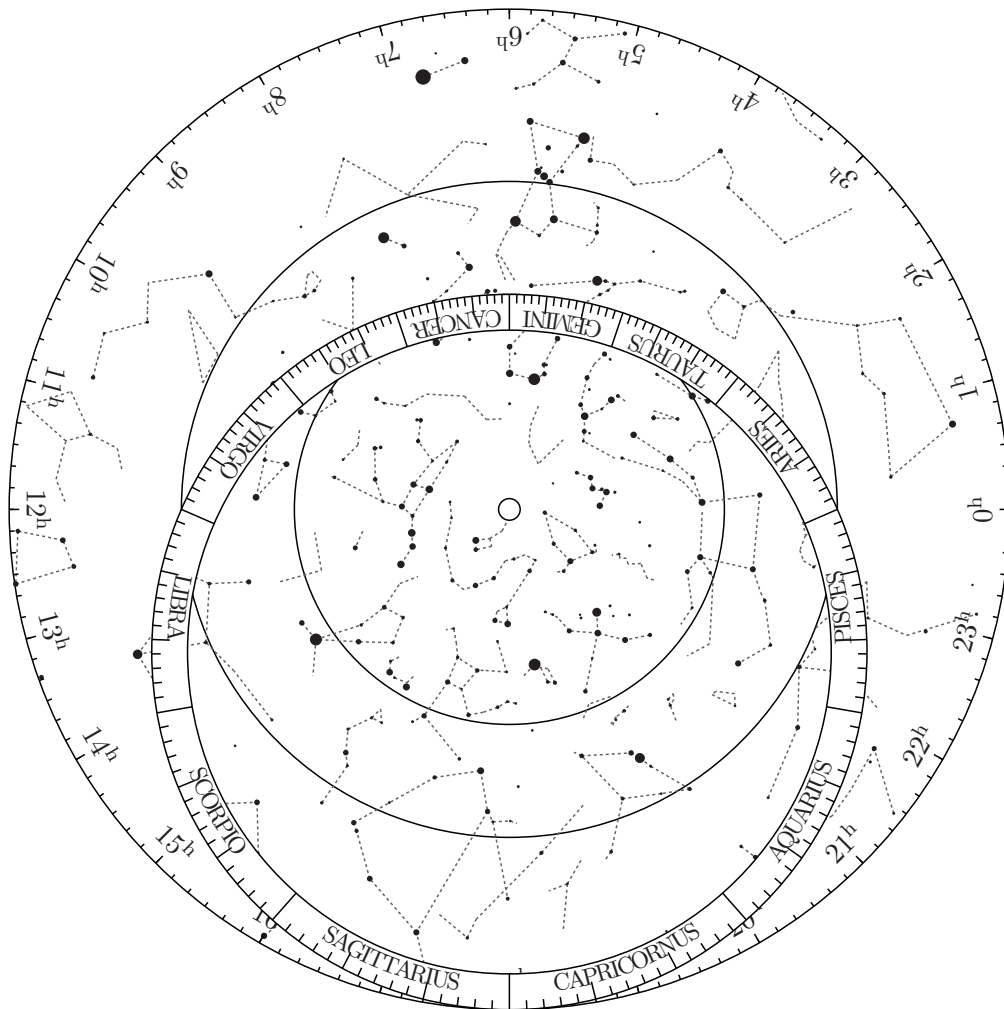
Figure 4: The rete of the astrolabe, showing the stars of the night sky. This should be printed onto a piece of transparent plastic; most stationers should be able to provide acetate sheets for use on overhead projectors, which are ideal for this purpose.